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(54) **PRINTER HEADPRINTERAND DRIVING METHOD FOR PRINTER HEAD**

(57)Abstract:
PROBLEM TO BE SOLVED: To make a streak which is caused by a positional shift of hitting ink in between head chips inconspicuous when a printer head is constituted by providing the head chips in parallel.
SOLUTION: In a printer head 10 in which a line head is formed by providing a plurality of head chips 20 (20A20B...) which align a plurality of discharge parts 30 for discharging ink drops in a printing line direction in the printing directionthe plurality of adjacent discharge parts 30 of the head chips 20 are arranged so as to have overlap partsand hitting intervals of ink drops which are discharged from the discharge parts 30 of the overlap part of one side of the head chips 20 of the adjacent head chips 20 are different from the hitting intervals of the ink drops which are discharged from the discharge parts 30 of the overlap part of the other side head chips 20 thereof.

CLAIMS

[Claim(s)]
[Claim 1]A head chip which aligned two or more discharge parts for carrying out the regurgitation of the ink drop in a printing line direction by installing more than one in a printing line direction side by sideWhile arranging so that said two or more discharge parts of both sides located in an adjacent part of the 1st head chip and the 2nd head chip may overlap in a printer head in which a line head was formedA printer head characterized by making it an impact interval of an ink drop breathed out from said discharge part of a portion which said 1st head chip overlapped differ from an impact interval of an ink drop breathed out from said discharge part of a portion which said 2nd head chip overlapped.
[Claim 2]An interval of a nozzle of each aforementioned discharge part of a portion which said 1st head chip overlapped in the printer head according to claim 1A printer head currently forming so that intervals of a nozzle of each aforementioned discharge part of a portion which said 2nd head chip overlapped may differ.
[Claim 3]An interval of a heater of each aforementioned discharge part of a portion which said 1st head chip overlapped in the printer head according to claim 1 or 2A printer head currently forming so that intervals of a heater of each aforementioned discharge part of a portion which said 2nd head chip overlapped may differ.
[Claim 4]In a printer head of a statementin any 1 paragraph from claim 1 to claim 3either said 1st head chip or said 2nd head chip It is formed so that it may become larger than an impact interval of an ink drop breathed out from said discharge parts other than a portion which an impact interval of an ink drop breathed out from said discharge part of an overlapped portion overlappedA printer headwherein another side is formed so that it may become narrower than an impact interval of an ink drop breathed out from said discharge parts other than a portion which an impact interval of an ink drop breathed out from said discharge part of an overlapped portion overlapped.
[Claim 5]In a printer head of a statementin any 1 paragraph from claim 1 to claim 3either said 1st head chip or said 2nd head chip Are formed so that impact intervals of an ink drop breathed out from each aforementioned discharge part including said discharge part of an overlapped portion may become equaland another sideA printer head currently forming so that an impact interval of an ink drop breathed out from said discharge part of an overlapped portion may differ from an impact interval of an ink drop breathed out from said discharge part of a portion which said one side overlapped.
[Claim 6]In a printer head given in any 1 paragraph from claim 1 to claim 5A printer head provided with a discharge part information storage means which memorizes information about said discharge part used at the time of a print among said two or more discharge parts of a portion which said 1st head chip and said 2nd head chip overlapped.
[Claim 7]A printer equipping any 1 paragraph from claim 1 to claim 6 with a printer head of a statement.
[Claim 8]A printer comprising provided with the printer head according to claim 6:
A discharge part information reading means which reads information about said discharge part used at the time of a print memorized by said discharge part information storage means.

A regurgitation control means which controls regurgitation of an ink drop by said discharge part which said printer head overlapped based on information read by said discharge part information reading means.

[Claim 9]It is a drive method of a printer head given in any 1 paragraph from claim 1 to claim 6An impact position of an ink drop by said discharge part where said 1st head chip is specific among said discharge parts of an overlapped portion of said 1st head chip and said 2nd head chipAn interval in a printing line direction with an impact position of an ink drop by said specific discharge part of said 2nd head chipIn a position nearest to an interval in a printing line direction of an impact position of an ink drop by said discharge parts other than a portion which said 1st head chip or said 2nd head chip overlapped. A drive method of a printer head characterized by driving said 1st head chip and said 2nd head chip so that it may change from regurgitation of an ink drop by said discharge part of said 1st head chip to regurgitation of an ink drop by said discharge part of said 2nd head chip.
[Claim 10]In said discharge part of a portion which either said 1st head chip or said 2nd head chip overlapped in a drive method of the printer head according to claim 9An impact position of an ink drop by said specific discharge part of said 1st head chip when regurgitation of an ink drop is shifted by at least 1 discharge partAn interval in a printing line direction with an impact position of an ink drop by said specific discharge part of said 2nd head chipWhen becoming the closest to an interval in a printing line direction of an impact position of an ink drop by said discharge parts other than a portion which said 1st head chip or said 2nd head chip overlappedWhile changing from regurgitation of an ink drop by said discharge part of said 1st head chip to regurgitation of an ink drop by said discharge part of said 2nd head chip in the positionData for regurgitation of an ink drop by said discharge part of a portion which either said 1st head chip or said 2nd head chip overlapped is shifted by at least 1 discharge partA drive method of a printer head driving said 1st head chip and said 2nd head chip.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the drive method of the printer head used for a thermal ink jet line printer etc.and a printer provided with the printer head and a printer head.
[0002]
[Description of the Prior Art]Drawing 11 is a figure showing an example of the printer head in the conventional thermal ink jet line printer. In a line printerin order to carry out the print of the one line at once to the body for a printtwo or more head chips 1 (1A1B..) are installed in a printing line direction side by side. In drawing 11although only the two head chips 1A and 1B are illustratedtwo or more head chips 1 are installed in the longitudinal direction side by side among the figure.
[0003]In the adjoining head chip 1up and downa position shifts and is arranged. This is because the ink passage is provided between the upper head chip 1A and the lower head chip 1B in drawing 11. Discharging timing is shifted and the head chips 1A and 1B of these upper and lower sides are breathed out so that a print result may be located in a line with a single tier.
[0004]Two or more discharge parts are established in each head chip 1respectively. The discharge part has aligned in the printing line direction. As shown in drawing 11each discharge part is arranged via the prescribed intervalrespectively. In the example of drawing 11the interval of a discharge part is L. This is common in all the head chips 1.
[0005]As shown in drawing 11the discharge part of the right end section of the head chip 1A and the discharge part of the left edge part of the head chip 1B which adjoins the head chip 1A are printing line directionsand the interval L is separated and it is arranged further again. Even if it makes an ink drop reach the target using two or more head chips 1all the ink drops can be made to reach the body for a print at intervals of Lif it does in this way.
[0006]
[Problem(s) to be Solved by the Invention]Howeverink reaches the position as an original designed value with neither the accuracy of position of the head chip 1nor the fitting location accuracy of the heater (not shown) for making an ink drop heat and breathe out or the accuracy of position of the nozzle 2. The characteristics may differ greatly for especially every head chip. For this reasonvariation had arisen in the pitch between the ink drops which reached the body for a print for every head chip.
[0007]This problem will appear notably especiallyif a heater position and the position of the nozzle 2 shift. Although the influence of the impact position on this gap changes with the composition of a discharge partetc.there are some which incline 0.2 degree as a discharge direction only by 1 micrometer of centers of a heater position and the position of the nozzle 2 shifting. When it was and a discharge part and the body for a print have got used 2 mm in this caseno less than 7 micrometers will shift from a position with a regular impact position of a dot. Therefereven if the position of a heater suits a regular positionfor exampleSupposing -1 micrometer of positions of the nozzle 2 shifted from the regular position to the discharge part line direction in one head chip 1 and are shifted from the regular position +1 micrometer to the discharge part line direction in another head chip 1Sinceas for one side-7micrometer and +7 micrometers of another side shift from a regular position as an impact position to the body for a print which got used 2

mm from the discharge parta total 14micrometer interval will spread.
[0008]Drawing 12 is a figure showing a situation when an ink drop is breathed out on the body for a print. In drawing 12what what was shown by the black dot of the left half showed what reached the target by the head chip 1Aand was shown with a circle [of the right half / white] shows what reached the target by the head chip 1B.
[0009]Heredrawing 12 (a) shows the thing without the relative impact position gap with the head chips 1A and 1B. In (a)the interval of the impact position of the ink drop of the right end section by the head chip 1A and the impact position of the ink drop of the left edge part by the head chip 1B is the same in the impact position interval (L) of the ink drop in each head chip 1and abbreviationand the stripe is not generated in a knot.
[0010]On the other handdrawing 12 (b) and (c) shows the example which the relative impact position gap with the head chips 1A and 1B has produced. Drawing 12 (b) shows that to which the impact interval with the head chips 1A and 1B is larger than Land the figure (c) shows that to which the impact interval with the head chips 1A and 1B is narrower than L. Therebythere was a problem that it will be visible in the shape of [with white relative impact position gap with the head chips 1A and 1B] a stripe in the case of drawing 12 (b)and will be visible in the shape of [black] a stripe in the case of the figure (c).
[0011]In order to prevent generating of such impact position gap between the head chips 1the mounting precision of the nozzle 2 or a heater will be raisedbut there was a limit in raising the accuracy.
[0012]Therefore the issue which this invention tends to solve is making not conspicuous the stripe by the impact position gap between head chipswhen a head chip is installed side by side and it constitutes a printer head.
[0013]
[Means for Solving the Problem]This invention solves an above-mentioned technical problem by the following solving means. An invention of claim 1 a head chip which aligned two or more discharge parts for carrying out the regurgitation of the ink drop in a printing line direction by installing more than one in a printing line direction side by sideWhile arranging so that said two or more discharge parts of both sides located in an adjacent part of the 1st head chip and the 2nd head chip may overlap in a printer head in which a line head was formedIt was made for an impact interval of an ink drop breathed out from said discharge part of a portion which said 1st head chip overlapped to differ from an impact interval of an ink drop breathed out from said discharge part of a portion which said 2nd head chip overlapped.
[0014]An interval of a nozzle of each aforementioned discharge part of a portion where said 1st head chip overlapped an invention of claim 2 in the printer head according to claim 1It is formed so that intervals of a nozzle of each aforementioned discharge part of a portion which said 2nd head chip overlapped may differ.
[0015]In the printer head according to claim 1 or 2 an invention of claim 3It is formed so that an interval of a heater of each aforementioned discharge part of a portion which said 1st head chip overlapped may differ from an interval of a heater of each aforementioned discharge part of a portion which said 2nd head chip overlapped.
[0016]In a printer head of a statementan invention of claim 4 in any 1 paragraph from claim 1 to claim 3 either said 1st head chip or said 2nd head chip It is formed so that it may become larger than an impact interval of an ink drop breathed out from said discharge parts other than a portion which an impact interval of an ink drop breathed out from said discharge part of an overlapped portion overlappedAnother side is formed so that it may become narrower than an impact interval of an ink drop breathed out from said discharge parts other than a portion which an impact interval of an ink drop breathed out from said discharge part of an overlapped portion overlapped.
[0017]In a printer head of a statementan invention of claim 5 in any 1 paragraph from claim 1 to claim 3 either said 1st head chip or said 2nd head chip Are formed so that impact intervals of an ink drop breathed out from each aforementioned discharge part including said discharge part of an overlapped portion may become equaland another sideIt is formed so that an impact interval of an ink drop breathed out from said discharge part of an overlapped portion may differ from an impact interval of an ink drop breathed out from said discharge part of a portion which said one side overlapped.
[0018]In a printer head given in any 1 paragraph from claim 1 to claim 5 an invention of claim 6It has a discharge part information storage means which memorizes information about said discharge part used at the time of a print among said two or more discharge parts of a portion which said 1st head chip and said 2nd head chip overlapped.
[0019]An invention of claim 7 is a printer equipping any 1 paragraph from claim 1 to claim 6 with a printer head of a statement.
[0020]This invention is [invention of claim 8] characterized by that a printer provided with the printer head according to claim 6 comprises the following.
A discharge part information reading means which reads information about said discharge part used at the time of a print memorized by said discharge part information storage means.
A regurgitation control means which controls regurgitation of an ink drop by said discharge part which said printer head overlapped based on information read by said discharge part information reading means.

[0021]An invention of claim 9 is a drive method of a printer head given in any 1 paragraph from claim 1 to claim 6An impact position of an ink drop by said discharge part where said 1st head chip is specific among said discharge parts of an overlapped portion of said 1st head chip and said 2nd head chipAn interval in a printing line direction with an impact position of an ink drop by said specific discharge part of said 2nd head chipIn a position nearest to an interval in a printing line direction of an impact position of an ink drop by said discharge parts other than a portion which said 1st

head chip or said 2nd head chip overlapped. Said 1st head chip and said 2nd head chip are driven so that it may change from regurgitation of an ink drop by said discharge part of said 1st head chip to regurgitation of an ink drop by said discharge part of said 2nd head chip.

[0022]In a drive method of the printer head according to claim 9 an invention of claim 10In said discharge part of a portion which either said 1st head chip or said 2nd head chip overlappedAn impact position of an ink drop by said specific discharge part of said 1st head chip when regurgitation of an ink drop is shifted by at least 1 discharge partAn interval in a printing line direction with an impact position of an ink drop by said specific discharge part of said 2nd head chipWhen becoming the closest to an interval in a printing line direction of an impact position of an ink drop by said discharge parts other than a portion which said 1st head chip or said 2nd head chip overlappedWhile changing from regurgitation of an ink drop by said discharge part of said 1st head chip to regurgitation of an ink drop by said discharge part of said 2nd head chip in the positionAs data for regurgitation of an ink drop by said discharge part of a portion which either said 1st head chip or said 2nd head chip overlapped is shifted by at least 1 discharge partsaid 1st head chip and said 2nd head chip are driven.

[0023]In this inventionit is arranged so that two or more discharge parts of the 1st adjoining head chip and the 2nd head chip may overlap. An impact interval of an ink drop by a portion which the 1st head chip overlapped differs from an impact interval of an ink drop by a portion which the 2nd head chip overlapped.

[0024]In therefore a position near an interval with the most regular interval of impact of a specific ink drop by a portion which the 1st head chip overlappedand impact of a specific ink drop by a portion which the 2nd head chip overlapped. From impact of an ink drop by the 1st head chipa knot of impact of an ink drop between head chips can be made not conspicuous by changing to impact of an ink drop by the 2nd head chip.

[0025]

[Embodiment of the Invention]Hereafterone embodiment of this invention is described with reference to drawings etc. Drawing 1 (a) is a top view showing one embodiment of the printer head by this invention. This printer head 10 is applied to a thermal ink jet line printer.

[0026]between the head chips 20 which adjoin while the printer head 10 installs two or more head chips 20 (20A20B..) in a printing line direction side by side -- a sliding direction -- ** -- a fixed quantity is shifted and it arranges. This is because an ink passage (not shown) is formed between the head chip 20 arranged at the upper partand the head chip 20 arranged at the bottom and he is trying to supply liquid ink to each head chip 20 through the ink passage.

[0027]Drawing 1 (b) is an enlarged drawing of the A section among drawing 1 (a). As shown in drawing 1 (b)the discharge part 30 for carrying out the regurgitation of the ink drop has aligned at each head chip 20. And between the adjoining head chips 20it is arranged so that two or more discharge parts 30 may overlap in a printing line direction. Hereafterthis portion is called an overlap part. In the example of drawing 1 (b)the 16 discharge parts 30 each with the head chips 20A and 20B are located in an overlap part.

[0028]Drawing 2 is a top view showing the state where made the ink drop breathe out from the discharge part 30 near [each] the overlap part of the adjoining head chip 20and the body for a print was made to reach the target. The portion shown by a black dot shows among a figure what was breathed out in discharge parts 30 other than an overlap partand a white round head shows what was breathed out in the discharge part 30 of the overlap part. In drawing 2intervals other than an overlap part are set to L among the impact intervals of an ink droprespectively. At this timeamong the figureit is set up so that the impact interval of an upper overlap part may serve as (L+alpha).

[0029]On the other handamong the figureit is set up so that the impact interval of a lower overlap part may serve as (L-alpha). That isthe impact interval of the ink drop of an upper overlap part is set up so that only alpha may become large from the impact interval of ink drops other than an overlap part. On the other handthe impact interval of the ink drop of a lower overlap part is set up so that only alpha may become narrow from the impact interval of ink drops other than an overlap part.

[0030]If the number of the discharge parts 30 of each overlap part is set to N (the example of drawing 2 16 pieces)the length in the whole overlap part will be set to xN with the up side (L+alpha)and will be set to xN with the down side (L-alpha). L2 in drawing 2 is set as Lx (N+1). As a resultthe impact interval in the printing line direction of an upper impact position and a lower impact position is set up in the mid-position of each overlap part so that it may be set to L which is impact intervals other than an overlap part.

[0031]That isthe interval of the impact located in xN/2 from left-hand side in an upper overlap part (L+alpha) and the impact located in xN/2 from right-hand side in a lower overlap part (L-alpha) is set as L.

[0032]Nexthow to change the impact interval of an ink drop by an overlap part is explained. Drawing 3 is a sectional view showing the structure of each discharge part 30 of the head chip 20. The three discharge parts 30 are illustrated in drawing 3. In the discharge part 30the heater 22 is for heating an ink dropfor exampleit is provided on the substrate 23 of silicomand the drive is controlled by a predetermined drive circuit. On this substrate 23the heater 22 and the septum 24 made by resin are formed.

[0033]Of this septum 24the liquid ink room 25 which has the heater 22 is formed. The nozzle sheet 26 is formed on the septum 24. The nozzle 21 by which the opening was carried out to the circle configuration is formed in the nozzle sheet 26.

[0034]And the ink led to the ink passage (not shown) from the ink tank (not shown) is guided at the liquid ink room 25and is heated with the heater 22 in the liquid ink room 25. And an ink drop is made to breathe out from the nozzle 21 by the energy at the time of this heating.

[0035]Herein discharge parts 30 other than an overlap partthe heater 22 and the nozzle sheet 26 are relatively arranged so that the center line of the heater 22 and the center line of the nozzle 21 may be in agreement. The interval of each center line is an interval of the size L shown by drawing 2.
[0036]Drawing 4 is a sectional view in the overlap part of the head chip 20and portions other than an overlap part showing the size of the discharge part 30 installed side by sideand (a) - (c) shows three different examplesrespectively. The three left-hand side discharge parts 30 show things other than an overlap part among a figureand the three right-hand side discharge parts 30 show the thing of an overlap part.
[0037]Firstamong the figurein the example of (a)the arrangement space of the heater 22 is equal intervals other than an overlap part and an overlap partand is set as L. The arrangement space of the nozzle 21 is set as L equally to the arrangement space of the heater 22 in portions other than an overlap part. On the other handthe arrangement space of the nozzle 21 of an overlap part is larger than the arrangement space L of the heater 22and is set as (L+**1).
[0038]Among the figurein the example of (b)the arrangement space of the nozzle 21 is equal intervals other than an overlap part and an overlap partand is set as L. The arrangement space of the heater 22 is set as L equally to the arrangement space of the nozzle 21 in portions other than an overlap part. On the other handthe arrangement space of the heater 22 of an overlap part is narrower than the arrangement space L of the nozzle 21and is set as (L-**2).
[0039]In the example of (c)both the arrangement space of the heater 22 in portions other than an overlap part and the arrangement space of the nozzle 21 are set as L among the figure further again. In the overlap partboth the arrangement space of the heater 22 and the arrangement space of the nozzle 21 are larger than the interval of portions other than an overlap partand are set as (L+**3).
[0040]as mentioned above -- the example of (a) and (b) -- an overlap part -- the center line of the heater 22and the center line of the nozzle 21 -- ** -- it will shift in fixed quantity. On the other handin the example of (c)even if it is an overlap partthe center line of the heater 22 and the center line of the nozzle 21 are in agreement.
[0041]Drawing 5 is a figure explaining the orbit of the breathed-out ink drop. Drawing 5 (a) is equivalent to drawing 4 (a)and drawing 5 (b) is equivalent to drawing 4 (c).
[0042]In the example of drawing 5 (a)the center line of the nozzle 21 and the center line of the heater 22 are not in agreement. For this reasononly a predetermined angle shifts from the center line of the nozzle 21and an ink drop is breathed out. Thereforein this casethe amount of gaps of an impact position becomes largeso that the gap R1 from the discharge position of an ink drop to a print surface and R2 are large. For exampleif a gap doubles to R2 from R1the amount of gaps will also double.
[0043]On the other handin the example of drawing 5 (b)since the center line of the nozzle 21 and the center line of the heater 22 are in agreementthe breathed-out ink drop is breathed out in parallel with the center line of the nozzle 21. Even if it is when the arrangement space of the nozzle 21 and the heater 22 is larger than an overlap partand this is when narrowit is the same. Thereforein this caseeven if a gap changes to R2 from R1it shiftsand it is changeless in quantity.
[0044]As drawing 4 (b) showedeven if it is when the interval of the heater 22 is narrower than the interval of the nozzle 21 in an overlap partlike drawing 5 (a)only a predetermined angle shifts from the center line of the nozzle 21and an ink drop is breathed out. It is also the same as when [that the interval of the nozzle 21 is larger than the size L and] the interval of the heater 22 is narrower than the size Lor when [that the interval of the nozzle 21 is narrower than the size L and] the interval of the heater 22 is larger than the size L.
[0045]As mentioned abovewhile making the interval of the (1) heater 22 the same in an overlap part and portions other than an overlap partWhen the interval of the nozzle 21 is made larger than the interval of the heater 22 in an overlap partwhile making the interval of the (2) nozzle 21 the same in portions other than an overlap part and an overlap partWhen the interval of the heater 22 is made narrower than the interval of the nozzle 21 in an overlap part(3) In [when the interval of the heater 22 is made narrower than portions other than an overlap part in an overlap part and the interval of the nozzle 21 is made larger than portions other than an overlap part] (4) overlap partsWhen the interval of the nozzle 21 and the heater 22 is made larger than both portions other than an overlap partin an overlap partthe impact interval of an ink drop becomes larger than portions other than an overlap part.
[0046]Similarlywhile making the interval of the (1) heater 22 the same in portions other than an overlap part and an overlap partWhen the interval of the nozzle 21 is made narrower than the interval of the heater 22 in an overlap partwhile making the interval of the (2) nozzle 21 the same in portions other than an overlap part and an overlap partWhen the interval of the heater 22 is made larger than the interval of the nozzle 21 in an overlap part(3) In [when the interval of the heater 22 is made larger than portions other than an overlap part in an overlap part and the interval of the nozzle 21 is made narrower than portions other than an overlap part] (4) overlap partsWhen the interval of the nozzle 21 and the heater 22 is made narrower than both portions other than an overlap partin an overlap partthe impact interval of an ink drop becomes narrower than portions other than an overlap part.
[0047]In the adjoining head chip 20the impact interval of the ink drop of the overlap part of one head chip 20 is made largeand it is made to narrow the impact interval of the ink drop of the overlap part of the head chip 20 of another side by adopting either among the above.
[0048]Herewhen changing the interval of the nozzle 21it is required for the opening region of the nozzle 21 to exist in the upper surface area of the liquid ink room 25. On the other handwhen changing the interval of the heater 22it is required for the heater 22 to exist in the liquid ink room 25.
[0049]Thereforewhen changing [having changed only the interval of the nozzle 21as shown in (a) of drawing 4and

(b)having changed only the interval of the heater 22or] the nozzle 21 and the heater 22 at a different intervalthe margin over the accuracy of position of the nozzle 21 or the heater 22 becomes small. On the other handwhile the distance between the septa 24 has been constant like drawing 4 (c)when changing both the interval of the nozzle 21and the interval of the heater 22the margin over the accuracy of position of the nozzle 21 or the heater 22 is equivalent except an overlap part.

[0050]Thenthe drive method of the head chip 20 is explained more concretely. The impact position of the ink drop by the specific discharge part 30 of one [among the head chips 20 of the couple which adjoins in this embodiment] head chip 20In the position nearest to impact intervals other than an overlap partthe interval in a printing line direction with the impact position of the ink drop by the specific discharge part 30 of the head chip 20 of another side. From the regurgitation of the ink drop by one head chip 20each head chip 20 is driven so that it may change to the regurgitation of the ink drop by the head chip 20 of another side. If it does in this wayimpact position gap of the ink drop between the head chips 20 can be lostor it can avoid being conspicuous.

[0051]Drawing 6 is a figure explaining a 1st embodiment about the change of the regurgitation of the ink drop of the head chip 20. Drawing 6 (a) In - (e)impact of the ink drop shown in the upper row is based on one head chip 20 among the adjoining head chips 20and impact of the ink drop shown in the lower berth is based on the head chip 20 of another side. Drawing 6 changes relatively the nozzle 21 of the overlap part of the head chip 20and the center position of the heater 22and it is made for the impact intervals of the ink drop of an overlap part to differ.

[0052]Firstdrawing 6 (a) is a designed value of the ink impact in this exampleand 16 ink drops make it the thing in which the regurgitation is possible by the overlap part of each head chip 20respectively. The impact interval of ink drops other than the overlap part in both head chips 20 presupposes that it is 42.3 micrometers.

[0053]By the upper overlap partthe impact interval is set as 43.6 micrometers larger 1.3 micrometers than portions other than an overlap part among the figure. By the lower overlap partthe impact interval is set as 41.0 micrometers narrower 1.3 micrometers than portions other than an overlap part among the figure.

[0054]Although values [these] differ in a actual device somewhat with the accuracy of position of the nozzle 21 or the heater 22Since the accuracy between the adjacent discharge parts 30 within the same head chip 20 is quite highit becomes a value near this designed value in generalbut since such accuracy of position differs greatly between the head chips 20an impact position will shift relatively. Drawing 6 (b) shows the example whose relative impact position gap with one head chip 20 and the head chip 20 of another side is 0 micrometer. In this caseit counts from the left among upper overlap partscounts from the left among the 8th ink drop and a lower overlap partand the impact interval in the direction of a print with the 9th ink drop is set to 42.3 micrometers. That isthis impact interval is equal to impact intervals other than an overlap part. Thereforein this positionif the regurgitation of an ink drop is changed from one head chip 20 to the head chip 20 of another sidethe knot between the head chips 20 can be made not conspicuous.

[0055]Drawing 6 (c) shows the example whose relative impact position gap with one head chip 20 and the head chip 20 of another side is +13 micrometers. Hereexplanation is returned to drawing 2. In drawing 2relative impact position gap with one head chip 20 and the head chip 20 of another side is set to beta. When it counted from the leftand an ink drop is breathed out to the Kthit counts from the left in a lower overlap part and an ink drop is breathed out from the K+1st by an upper overlap part among a figure at this timeWhen the impact interval of one head chip 20 and the head chip 20 of another side approaches most impact intervals L other than an overlap parta position to the change position of an upper overlap part of A is set to x(L+alpha) K. The change position of a lower overlap part is L2+beta-(L-alpha) x(N-K) from the position of A.

Since a next door and this difference should just be set to Lit becomes L2+beta-(L-alpha) x(N-K)-(L+alpha) xK=L. When L2=Lx (N+1) is substitutedit is K(formula 1) =(alphaxN+beta)/(2xalpha).

It becomes. Thereforeit will be set to K= 13if alpha= 1.3 micrometersN= 16and beta= 13 micrometers are substituted for the above-mentioned formula 1 when relative impact position gap is +13 micrometers as shown in drawing 6 (c).

[0056]Thereforeif it counts from the leftand an ink drop is breathed out by an upper overlap part to the 13thit counts from the left by a lower overlap part in an upper overlap part and the regurgitation of the ink drop is carried out from the 14th in the example of drawing 6 (c)The impact interval in the direction of a print of the ink drop of a change portion is set to 42.3 micrometers. Thereforein this positionif the regurgitation of an ink drop is changed from one head chip 20 to the head chip 20 of another sidethe knot between the head chips 20 can be made not conspicuous.

[0057]Nextdrawing 6 (d) shows the example whose relative impact position gap with one head chip 20 and the head chip 20 of another side is -8micrometer. In this caseit will be set to K**4.9 if the above-mentioned formula 1 is used.

[0058]Thereforeif it counts from the leftand an ink drop is breathed out by an upper overlap part to the 5thit counts from the left by a lower overlap part in an upper overlap part and the regurgitation of the ink drop is carried out from the 6th in the example of drawing 6 (d)The impact interval in the direction of a print of the ink drop of a change portion is set to 42.1 micrometersand serves as a value nearest to 42.3 micrometers which is impact intervals other than an overlap part.

[0059]Drawing 6 (e) shows the example whose relative impact position gap with one head chip 20 and the head chip 20 of another side is +30 micrometers. Hereagainif the value of K is several N or less [of the discharge part 30 of an overlap part] when the above-mentioned formula 1 is examinedit can respond to the relative impact position gap with one head chip 20 and the head chip 20 of another side. That isit is K<=N (formula 2). Thereforein the example of drawing 6if the relative impact position gap beta is beta<=20.8 (micrometer)it can respond. Actuallyif it is beta= 21.2 (micrometer) gradeit can respond as K=N.

[0060]Howeverin the example of drawing 6 (e)since relative impact position gap is +30 micrometersit cannot respond like drawing 6 (b) - (d). Howeverif the regurgitation of the ink drop by a lower overlap part is shifted by 1 dot and consideredrelative impact position gap is able to realize +30 micrometers to be -12.3micrometer. Thereforein [if an ink drop is breathed out from the left of an overlap part to the Kth by the upper head chip 20 and it thinks from the left that the regurgitation of the ink drop is carried out from the Kth by the lower head chip 20] drawing 2A position to the change position of an upper overlap part of A is set to x(L+alpha) K. The change position of a lower overlap part is L2+beta from the position of A. - (L-alpha)x (N-K+1)

Since a next door and this difference should just be set to Lit becomes L2+beta-(L-alpha) x(N-K+1)-(L+alpha) xK=L. When L2=Lx (N+1) is substitutedit is K(formula 3) =(alphax(N+1)-L+beta)/(2xalpha).

It becomes. Hereit will be set to K**3.77 if alpha= 1.3 micrometersL= 42.3 micrometersbeta= 30 micrometersand N= 16 are substituted.

[0061]Thereforein the example of drawing 6 (e)it counts from the left and an ink drop is breathed out by an upper overlap part to the 4thand if a lower overlap part is counted from the left and the regurgitation of the ink drop is carried out from the 4thit can set the impact interval in the direction of a print of the ink drop of a change portion to 41.7 micrometers. Howeverin this casethe liquid ink number of drop which reaches the target by an overlap part will be 17 piecesand one piece's increases. Thereforewhen carrying out the regurgitation of the ink drop by the lower head chip 20it is necessary to shift and give every one regurgitation data of each discharge part 30.

[0062]Drawing 7 is a figure explaining a 2nd embodiment about the change of impact of the ink drop of the head chip 20and (a) - (e) corresponds to (e) from (a) of drawing 6respectively.

[0063]In the example of drawing 7the gap from the tip of the discharge part 30 to a print surface is made narrower than drawing 6. For examplesupposing a gap is 2 mm in the example of drawing 6the example of drawing 7 shows the 1-mm thing of the half. In other wordsthe example of drawing 7 makes a half the gap from the tip of the discharge part 30 to a print surface using the same head as the example of drawing 6.

[0064]In this casesince the center position of the nozzle 21 and the heater 22 is shifted relatively and the impact interval is changedthe variation of an interval will also become half if the gap of the tip of the discharge part 30 and a print surface becomes half. Thereforealthough the impact interval of ink drops other than an overlap part is 42.3 micrometers and is the same as the example of drawing 6the impact interval of an upper overlap part becomes half [in the case of drawing 6] among a figure more widely (42.95 micrometers of impact intervals) 0.65 micrometer than portions other than an overlap part. Similarlyamong a figurethe impact interval of a lower overlap part is narrower than portions other than an overlap part 0.65 micrometerand is set to 41.65 micrometers.

[0065]Drawing 7 (b) shows the example whose relative impact position gap is 0 micrometer like drawing 6 (b). In this caselike drawing 6 (b)it counts from the left among upper overlap partscounts from the left among the 8th ink drop and a lower overlap partand the impact interval in the direction of a print with the 9th ink drop is set to 42.3 micrometers. Thereforein this positionif the regurgitation of an ink drop is changed from one head chip 20 to the head chip 20 of another sidethe knot between the head chips 20 can be made not conspicuous.

[0066]Drawing 7 (c) shows the example whose relative impact position gap with one head chip 20 and the head chip 20 of another side is +6.5 micrometers. Herewhen the cause of relative impact position gap is in the position shift of the nozzle 21 and the heater 22 and the gap from the tip of the discharge part 30 to a print surface is a halfthe amount of impact position gaps also becomes half. This is clear also from explanation of drawing 5. That isby drawing 7 (c)it is set to +6.5 micrometers to relative impact position gap+13micrometer in drawing 6 (c). It will be set to K= 13 if these values are assigned to the formula 1. Thereforeif the regurgitation of an ink drop is changed from one head chip 20 to the head chip 20 of another side in the same position as drawing 6 (c) also at this timethe knot between the head chips 20 can be made not conspicuous.

[0067]In the example of drawing 7 (d)relative impact position gap shows further again the example which is -4micrometer. This example as well as the above is set to -4micrometer of a half to relative impact position ****-8micrometer in drawing 6 (d). It will be set to K**4.9 if these values are assigned to the formula 1. Thereforeif the regurgitation of an ink drop is changed from one head chip 20 to the head chip 20 of another side in the same position as drawing 6 (d) also in this casethe knot between the head chips 20 can be made not conspicuous.

[0068]Nextin the example of drawing 7 (e)it is set to +15 micrometers of a half from +30 micrometers which is relative impact position gap of drawing 6 (e). In the overlap part of each head chip 20 at the example of drawing 6 (e)Although the regurgitation cannot be changed in a total of 16 ink dropsit is considered as the liquid ink number of drop with 17 pieces which carries out the regurgitation by an overlap partWhen the regurgitation of the ink drop was carried out by the lower head chip 20it was able to respond by shifting and carrying out the regurgitation of every one regurgitation data given to each discharge part 30.

[0069]Howevera gap is set to 1 mmand when the relative impact position gap between the head chips 20 is +15 micrometerthe regurgitation cannot be changed by a total of 16 ink drops. That isfrom the above-mentioned formula 1 and the formula 2it is set to K**19.5 and K<=N is not filled. It cannot respond like drawing 6 (e)either. Thuswhen the gap from the tip of the discharge part 30 to a print surface changesthe case where it cannot respond arises.

[0070]Drawing 8 is a figure explaining a 3rd embodiment about the change of the regurgitation of the ink drop of the head chip 20and (a) - (e) corresponds to (a) - (e) of drawing 6 and drawing 7respectively. In the example of drawing 8the gap from the tip of the discharge part 30 to a print surface is made still larger than drawing 7. Supposing a gap is 2 mm in the case of the example of drawing 6in the example of drawing 8it may be 3 mm. Since this head shifts the

center position of the nozzle 21 and the heater 22 relatively and the impact interval is changedif the gap from the tip of the discharge part 30 to a print surface increases 1.5 timesthe variation of an impact interval will also increase 1.5 times.
[0071]Thereforealthough ink impact intervals other than an overlap part are 42.3 micrometers and are the same as the example of drawing 61.95 micrometers of impact intervals of a lower overlap part become narrow (40.35 micrometers of impact intervals) among a figure more widely [the impact interval of an upper overlap part / 1.95 micrometers] (44.25 micrometers of impact intervals) among a figure than portions other than an overlap part. Impact relative-position gap is an example which is 0 micrometerand drawing 8 (b) is the same position as the position shown by drawing 6 (b) in this caseand if the regurgitation of an ink drop is changed from one head chip 20 to the head chip 20 of another sideit can make the knot between the head chips 20 not conspicuous.
[0072]Drawing 8 (c) shows the example whose relative impact position gap is +19.5 micrometers. It is because it increases +13-micrometer 1.5 times which is relative impact position gap of drawing 6 (c) when this also has a cause of relative location gap in the position shift of the nozzle 21 and the heater 22. Also in this caseif the regurgitation of an ink drop is changed from one head chip 20 to the head chip 20 of another side in the same position as drawing 6 (c)the knot between the head chips 20 can be made not conspicuous.
[0073]In the example of drawing 8 (d)relative impact position gap shows further again the example which is -12micrometer. This example as well as the above increases 1.5 times to -8 micrometers which is relative impact position gap by drawing 6 (d). Thereforeif the regurgitation of an ink drop is changed from one head chip 20 to the head chip 20 of another side in the same position as drawing 6 (d) also in this casethe knot between the head chips 20 can be made not conspicuous.
[0074]Nextin the example of drawing 8 (e)it is set to +45 micrometers1.5 timesfrom +30 micrometers which is relative impact position gap of drawing 6 (e). Like drawing 6 (e)from the formula 1 and the formula 2it is set to K**19.5 and K<=N is not filled with this example. Howeverlike drawing 6 (e)if impact of the ink drop by a lower overlap part is shifted by 1 dot and consideredrelative impact position gap is able to realize +45 micrometers to be +2.7 micrometers. In this caseit is set to K**9.19 from the formula 3.
[0075]Thereforeif it counts from the leftand an ink drop is breathed out by an upper overlap part to the 9thit counts from the left in a lower overlap part and the regurgitation of the ink drop is carried out from the 9th in the example of drawing 8 (e)The impact interval in the direction of a print of the ink drop in a change portion can be 43.05 micrometers. Howeverlike drawing 6 (e)the liquid ink number of drop which reaches the target by an overlap part will be 17 piecesand one piece's increases in this case. Thereforewhen carrying out the regurgitation of the ink drop by the lower head chip 20it is necessary to shift and carry out the regurgitation of every one regurgitation data given to each discharge part 30. Drawing 6 (e) is a different position and this will change the head chip 20.
[0076]Drawing 9 is a figure explaining a 4th embodiment about the change of impact of the ink drop of the head chip 20. Drawing 9 (a) In - (e)impact of the ink drop shown in the upper row is based on the overlap part of one head chip 20and impact of the ink drop shown in the lower berth is based on the overlap part of the head chip 20 of another side.
[0077]By an overlap partas drawing 5 (b) showeddrawing 9Only the same length both changes the interval of the nozzle 21and the interval of the heater 22it is made for the impact intervals of the ink drop of an overlap part to differand the gap from the tip of the discharge part 30 to a print surface is 1 mm. Drawing 9 (a) is a designed value of the ink impact in this exampleand 16 ink drops make it the thing in which the regurgitation is possible by the overlap part of each head chip 20 like the example of drawing 6 - drawing 8respectively. The impact interval of ink drops other than the overlap part in both head chips 20 is 42.3 micrometers.
[0078]By the upper overlap partthe impact interval of the ink drop is set as 43.6 micrometers larger 1.3 micrometers than portions other than an overlap part among the figure. By the lower overlap partthe impact interval of the ink drop is set as 41.0 micrometers narrower 1.3 micrometers than portions other than an overlap part among the figure. With the accuracy of position of the nozzle 21 or the heater 22although values [these] differ somewhat in a actual devicewith itSince the accuracy between the discharge parts 30 which adjoin each other within the same head chip 20 is quite highit becomes a value near this designed value in generalbut since such accuracy of position differs greatly between the head chips 20an impact position will shift relatively.
[0079]Drawing 9 (b) shows the example whose relative impact position gap with one head chip 20 and the head chip 20 of another side is 0 micrometer. In this caseit counts from the left among upper overlap partscounts from the left among the 8th ink drop and a lower overlap partand the impact interval in the direction of a print with the 9th ink drop is set to 42.3 micrometers. That isthis impact interval is equal to impact intervals other than an overlap part. Thereforein this positionif the regurgitation of an ink drop is changed from one head chip 20 to the head chip 20 of another sidethe knot between the head chips 20 can be made not conspicuous.
[0080]Drawing 9 (c) shows the example whose relative impact position gap with one head chip 20 and the head chip 20 of another side is +6.5 micrometers. At this timeit is set to K= 10.5 from the formula 1. Thereforein this caseit counts from the left among upper overlap partscounts from the left among the 10th ink drop and a lower overlap partand the impact interval in the direction of a print with the 11th ink drop is set to 43.6 micrometers. Thereforein this positionif the regurgitation of an ink drop is changed from one head chip 20 to the head chip 20 of another sidethe knot between the head chips 20 can be made not conspicuous.
[0081]Drawing 9 (d) shows the example whose relative impact position gap with one head chip 20 and the head chip 20 of another side is -4micrometer. At this timeit is set to K**6.46 from the formula 1. Thereforein this caseit counts from the left among upper overlap partscounts from the left among the 6th ink drop and a lower overlap partand the impact

interval in the direction of a print with the 7th ink drop is set to 43.5 micrometers. Thereforein this positionif the regurgitation of an ink drop is changed from one head chip 20 to the head chip 20 of another sidethe knot between the head chips 20 can be made not conspicuous.
[0082]Drawing 9 (e) shows the example whose relative impact position gap with one head chip 20 and the head chip 20 of another side is +15 micrometers. At this timeit is set to K**13.8 from the formula 1. Thereforein this caseit counts from the left among upper overlap partscounts from the left among the 14th ink drop and a lower overlap partand an impact interval with the 15th ink drop is set to 41.7 micrometers. Thereforein this positionif the regurgitation of an ink drop is changed from one head chip 20 to the head chip 20 of another sidethe knot between the head chips 20 can be made not conspicuous.
[0083]Herein the example of drawing 7as drawing 7 (e) showedwhen relative impact position gap was +15 micrometersit was not able to respond to the change of the regurgitation. Howeveras shown in drawing 9 (e)even if it is the same relative impact position gap at the time of the same gapin the case of the example of drawing 9it can respond.
[0084]Howeverin the case where only the same length changes both the interval of the nozzle 21and the interval of the heater 22and it is made for the impact intervals of the ink drop of an overlap part to differ like the example of drawing 9If the attachment error of the nozzle sheet 26 or the heater 22 arisesgap will arise on the regurgitation square of an ink drop. Thereforewhen a gap changes in this caseaccording to a gapthe relative impact position gaps between the head chips 20 come to differ. Thereforeif a gap changesit is necessary to change the change position which should change the regurgitation of an ink drop from one head chip 20 to the head chip 20 of another side.
[0085]As mentioned abovewhen the interval of the nozzle 21 and the interval of the heater 22 are relatively changed in the overlap part of the head chip 20may be unable to correspond to the relative impact position gap between the head chips 20but. When the cause of relative impact position gap is in the position shift of the nozzle 21 and the heater 22it has the merit that the change position of the regurgitation of an ink drop does not change with change of a gap. On the other handthe cause of relative location gap will need to change the change position of the regurgitation into the position shift of discharge part 30 self by change of a gap (when it is not discharging angle gap).
[0086]On the other handwhen only the same length changes both the interval of the nozzle 21and the interval of the heater 22. When the cause of relative impact position gap is in the position shift of the nozzle 21 and the heater 22the change position of the regurgitation of the ink drop of the head chip 20 changes with change of a gapbut it has the merit that it can respond to the big relative impact position gap between the head chips 20. The cause of relative impact position gap also has the merit that the change position of the regurgitation does not change by change of a gapin the position shift of discharge part 30 self (when it is not discharging angle gap).
[0087]Drawing 10 (a)(b)and (c) is a figure showing an example when the print of the impact is changed and carried out by the two head chips 20respectively. In drawing 10a black dot shows impact of the ink drop by one head chip 20and with a circle [white] shows impact of the head chip 20 of another side. At drawing 10 (a)the change position of the head chip 20 according to relative impact position gap shows the example which changed the regurgitation.
[0088]It may be made for this to make an ink drop breathe out by turns in a part for the several dots right and left of the change position of the head chip 20as shown in drawing 10 (b) and (c). In the example of (b)a change position is shifted by I dot for every line. While changing for every line and changing a positionit is made for the ink drop of the overlap part end of the head chip 20 of another side to exist in the example of (c) between the ink drops in the overlap part end of one head chip 20. The change can be made loose when there is a difference in the discharge quantity of an ink dropetc. between the two head chips 20 by doing in this way.
[0089]To a printer headthe inside of the discharge part 30 of the overlap part of each head chip 20It is used to which discharge part 30 among the information about the discharge part 30 used at the time of a printi.e.an overlap partThe discharge part information storage means (memory) which memorizes the information on from which discharge part 30 it is used among the discharge parts 30 of the overlap part of the head chip 20 of another side and the information on it is necessary which to shift the data for regurgitation further depending on the case is established. And what is necessary is to read the information about the discharge part 30 used at the time of the print memorized by the discharge part information storage meansand just to control the regurgitation of the ink drop by an overlap part by a discharge part information reading means by a regurgitation control means based on the read information at the time of a print.
[0090]As mentioned abovealthough one embodiment of this invention was describedfollowing various modification is possible for this inventionwithout being limited to the embodiment mentioned above.
(1) The numerical value shown by this embodiment is an exampleand is not limited to the numerical value shown by this embodiment. For examplewhether it is referred to as **0.5 micrometersit is referred to as **1.0 micrometersor it is referred to as **2.0 micrometers can determine arbitrarily the impact interval of the ink drop in an overlap part from portions other than an overlap part according to the output characteristics of the heater 22the character of inketc.
[0091](2) By this embodimentthe impact interval of the ink drop in an overlap part was made larger than portions other than an overlap partand was made narrower than portions other than an overlap part by the overlap part of another side at one overlap part. Howeverwithout restricting to thisin the overlap part which is one sidefor examplethe impact interval of portions other than an overlap part and an ink drop may be made equaland the impact interval of an ink drop may be made widely or narrower than portions other than an overlap part by the overlap part of another side. When making an impact interval large or narrowingit is not necessary to necessarily make it the same value.
[0092](3) By this embodimentalthough it was considered as the number of impact of the ink drop in the overlap part of each head chip 20 with 16 piecesit may be set as how many further againwithout being restricted to this.

[0093](4) In this embodimentalthough the impact interval of the ink drop in the overlap part by each head chip 20 was made into regular intervalsit may not be regular intervals. For exampleit is also possible to make it an interval become widely or narrow by the fixed rate of increase or percentage reduction. The impact interval of an ink drop may not be suddenly changed from an overlap partand the impact interval of an ink drop may be gradually made widely or narrow from several dots before an overlap part. If it does in this wayan impact interval can be changed still more automatically.

[0094](5) Although the printer head 10 of one color was mentioned as the example and this embodiment explained italso in the case of the multicolor (for examplecyanogenmagentayellowfour colors of black) printer head 10it can respond by preparing the printer head 10 for each colorsand arranging in the direction of a print.

[0095]

[Effect of the Invention]According to this inventionthe stripe generated in the knot during a bed chip can be made not conspicuous. A stripe can be made not conspicuous even if the accuracy of position of a nozzle and the accuracy of the fitting location of a heater are to some extent low. Thereforesince it becomes unnecessary to make highly precise accuracy of position of a nozzleand fitting location accuracy of a heaterthe manufacturing yield can be made high and reduction of a manufacturing cost can be aimed at.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1](a) is a top view showing one embodiment of the printer head by this inventionand (b) is an enlarged drawing of the A section among (a).

[Drawing 2]It is a top view showing the state where made the ink drop breathe out from the discharge part near [each] the overlap part of an adjoining head chipand the body for a print was made to reach the target.

[Drawing 3]It is a sectional view showing the structure of each discharge part of a head chip.

[Drawing 4]It is a sectional view in the overlap part of a head chipand portions other than an overlap part showing the size of the discharge part installed side by sideand (a) - (c) shows three different examplesrespectively.

[Drawing 5]It is a figure explaining the orbit of the breathed-out ink dropand (a) is equivalent to drawing 4 (a)and (b) is equivalent to drawing 4 (c).

[Drawing 6]It is a figure explaining a 1st embodiment about the change of the regurgitation of the ink drop of a head chip.

[Drawing 7]It is a figure explaining a 2nd embodiment about the change of the regurgitation of the ink drop of a head chip.

[Drawing 8]It is a figure explaining a 3rd embodiment about the change of the regurgitation of the ink drop of a head chip.

[Drawing 9]It is a figure explaining a 4th embodiment about the change of the regurgitation of the ink drop of a head chip.

[Drawing 10](a)(b)and (c) are the figures showing an example when the print of the regurgitation is changed and carried out by two head chipsrespectively.

[Drawing 11]It is a figure showing an example of the printer head in the conventional thermal ink jet line printer.

[Drawing 12]It is a figure showing a situation when an ink drop is breathed out on the body for a print.

[Description of Notations]

10 Printer head
20 (20A20B..) head chip
21 Nozzle
22 Heater
23 Substrate
24 Septum
25 Liquid ink room
26 Nozzle sheet
30 Discharge part